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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/455,408	12/06/1999	SYLVAIN SARDA	612.37806X00	5076

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EXAMINER
DAY, HERNG DER

ART UNIT	PAPER NUMBER
2123	11

DATE MAILED: 08/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

	Application No.	Applicant(s)
Office Action Summary	09/455,408	SARDA, SYLVAIN
	Examiner	Art Unit
	Herng-der Day	2123

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

· 1)☒ Responsive to communication(s) filed on *12 June 2003* .

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7-12* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *22 May 2003* is: a)☐ approved b)☒ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____ .

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1.   This communication is in response to Applicants' Response (paper # 10) to Office Action

dated February 12, 2003 (paper # 5), mailed June 12, 2003.

1-1.   Claims 1-6 have been cancelled; claims 7-12 have been added; claims 7-12 are pending.

1-2.   Claims 7-12 have been examined and claims 7-12 have been rejected.

Drawings

2.   The proposed drawing correction and/or the proposed substitute sheets of drawings, filed

on May 22, 2003 (paper # 8), have been disapproved for the following reasons. A proposed

drawing correction, corrected drawings, or amendment to the specification to add the reference

sign(s) in the description, are required in reply to the Office action to avoid abandonment of the

application. The objection to the drawings will not be held in abeyance.

2-1.   The Draftsperson has objected to the drawings; see the copy of Form PTO 948 for an

explanation.

2-2.   The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they

include the following reference sign(s) not mentioned in the description:

        (a) CN, in Fig.1 and Fig.2.

2-3.   The drawings introduce new matter into the drawings. 37 CFR 1.121(f) states that no

amendment may introduce new matter into the disclosure of an application. For example, no

evidence in the original specification supports steps 10 or 12 in Fig. 5 and step 108 in Fig. 6.

Specification

3.   The original objections to the specification (sections **4** to **4-3** in paper # 5) have been

withdrawn after Applicant amended the specification.

4.   The amendment filed June 12, 2003, is objected to under 35 U.S.C. 132 because it

introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall

introduce new matter into the disclosure of the invention. The amended material, which is not

supported by the original disclosure, is as follows:

   (1) Added [0011], as described in page 4 of the substitute specification.

   (2) Amended [0041] lines 5-9, as described in page 13 of the substitute specification.

   (3) Added [0064] and [0065], as described in pages 19-20 of the substitute specification.

   (4) Amended claim 9, as described in page 2 of paper # 10.

   Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Objections

5.   Claim 7 is objected to because of the following informalities. Appropriate correction is

required.

5-1.   Claim 7 recites the limitation "a fractured <u>multiplayer</u> porous medium", as described in

line 1 of the claim (Emphasis added).

Claim Rejections - 35 USC § 112

6.   The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making
and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 7-12 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

7-1. For example, as described in [0041] lines 1-3, page 12 of the substitute specification, "The pore volumes of the fracture meshes and of the matrix blocks (ϕ_i) are known by means of the mesh pattern", however, the pore volumes calculation of the fracture meshes has not been disclosed in the specification. The porosity of fracture meshes has not been provided as input data. Accordingly, it would require undue experimentation for one skilled in the art to make and/or use the invention when calculating the accumulation term (A_i) of the fracture mesh as shown in equations at page 14 of the substitute specification.

Applicant argues it has been described in the "aforementioned" U.S. Patent 6,023,656. However, the reference to *essential material* by "mention" to a foreign application or patent, or to a publication *as if it were incorporated* is improper because Applicant has not incorporated anything. Applicant has also amended paragraph [0041], as described in page 13 of the substitute specification, to disclose how the pore volume in a given fracture mesh is determined, which introduces new matter into the disclosure, as detailed in section 4 above.

7-2. Claim 9 recites the limitation "the matrix volume associated with each fracture mesh is defined by including all pixels that are closer to the corresponding node than to neighboring nodes", which appears to have no support in the original specification, as detailed in section 4 above. Claim 12 is rejected as being dependent on the rejected claim 9.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 9 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9-1. Claim 9 recites the limitation of defining "the matrix volume associated with each fracture mesh". However, it fails to further limit the subject matter of claim 8 and destroys the limitation recited in claim 8. For the purpose of claim examination, the Examiner will presume that claim 9 is a dependent claim of claim 7.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 7-8 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cacas et al., UK Patent Application GB 2322948 published September 9, 1998 (U.S. equivalent Patent 6,023,656, issued February 8, 2000), in view of Jones et al., "Control-Volume Mixed Finite Element Methods", Computational Geosciences, 1, 1997, pages 289-315.

11-1. Regarding claims 7-8 and 10-11, Cacas et al. disclose a method for modelling fluid flows in a fractured multilayer porous medium to simulate interactions between pressure and flow rate variations in a well through the medium, comprising:

discretizing the fractured medium by a mesh pattern with fracture meshes centered on

nodes at fracture intersections (nodes, page 13, lines 10-15); and

determining flows between each fracture mesh and the associated matrix volume in a

pseudosteady state (transmissivity factor, page 15, lines 3-15; therefore, will be constant);

the medium comprises fractured layers (fracture network, page 5, lines 3-6).

However, Cacas et al. fail to expressly disclose:

(1) each node being associated with a matrix volume;

(2) the matrix volume associated with each fracture mesh in each layer of the porous

medium contains all points which are closer to the corresponding node than to neighboring

nodes;

(3) determine a transmissivity value and the pressure varies linearly depending on a

distance from a point being considered to the fracture mesh associated with the matrix block.

Jones et al. disclose a control-volume mixed finite element method that provides a

simple, systematic, easily implemented procedure for obtaining accurate velocity approximations

on irregular block-centered grids because a key ingredient in simulation of flow in porous media

is accurate determination of the velocities that drive the flow (abstract, page i). Specifically,

Jones et al. disclose the missing elements:

each node being associated with a matrix volume (With each vertex, one associates a

control volume, page 4, lines 40-42);

the matrix volume associated with each fracture mesh in each layer of the porous medium

contains all points which are closer to the corresponding node than to neighboring nodes (control

volume, usually found by taking the Voronoi volume bounded by the perpendicular bisectors of

the sides of the triangles, page 4, lines 40-42);

determining at any point a transmissivity value for each pair of a fracture mesh and a

matrix block by considering that pressure varies linearly depending on a distance from a point

being considered to the fracture mesh associated with the matrix block (p is linearly interpolated

from the vertices to the interior, page 4 line 42 through page 5, line 1).

It would have been obvious to one of ordinary skill in the art at the time the invention

was made to modify the teachings of Cacas et al. to incorporate the teachings of Jones et al. to

obtain the invention as specified in claims 7-8 and 10-11 because the control-volume mixed

finite element method disclosed by Jones et al. provides a simple, systematic, easily implemented

procedure for obtaining accurate velocity approximations that drive the flow in porous media

(Jones, abstract, page i).

12.   Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cacas et

al., UK Patent Application GB 2322948 published September 9, 1998 (U.S. equivalent Patent

6,023,656, issued February 8, 2000), in view of Sarda et al., UK Patent Application GB 2322949

published September 9, 1998 (U.S. equivalent Patent 6,064,944, issued May 16, 2000).

12-1.   Regarding claims 9 and 12, Cacas et al. disclose a method for modelling fluid flows in a

fractured multilayer porous medium to simulate interactions between pressure and flow rate

variations in a well through the medium, comprising:

discretizing the fractured medium by a mesh pattern with fracture meshes centered on

nodes at fracture intersections (nodes, page 13, lines 10-15); and

determining flows between each fracture mesh and the associated matrix volume in a

pseudosteady state (transmissivity factor, page 15, lines 3-15; therefore, will be constant).

However, Cacas et al. fail to expressly disclose:

(1) each node being associated with a matrix volume;

(2) each fractured layer is discretized in pixels and the matrix volume associated with

each fracture mesh is defined by including all pixels that are closer to the corresponding node

than to neighboring nodes;

(3) determine a transmissivity value and the pressure varies linearly depending on a

distance from a point being considered to the fracture mesh associated with the matrix block.

Sarda et al. disclose a method, based on a pixel representation of the medium, which

determines the dimensions of equivalent blocks. With this method, a number of different

transfer functions applied to any type of heterogeneous medium can be easily and rapidly

computed (method, page 8, lines 1-13). The transfer function may represent variations between

different parts of the geological medium, variations in distances, transmissivities or heat

(function, page 6, line 26 through page 7, line 4). Specifically, Sarda et al. disclose the missing

elements:

each node being associated with a matrix volume (transposed medium, page 7, lines 5-

12);

each fractured layer is discretized in pixels (array of pixels, page 7, lines 14-15) and the

matrix volume associated with each fracture mesh is delimited by including all pixels that are

closer to the corresponding node than to neighboring nodes (distance, page 7, lines 16-26);

a transmissivity value is determined for each fracture mesh - matrix block pair by considering that the pressure varies linearly as a function of the distance from the point considered to the fracture mesh associated with the block (the "distance between pixels" function may express the transmissivity values, page 20, lines 14-20).

In order to model fluid flows in a fractured multiplayer porous medium, one of ordinary skill in the art would be motivated to solve problems of heterogeneous medium because it most likely exists in a multiplayer porous medium.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Cacas et al. to incorporate the teachings of Sarda et al. to obtain the invention as specified in claims 9 and 12 because with the teachings of Sarda et al. a number of different transfer functions applied to any type of heterogeneous medium can be easily and rapidly computed (Sarda, page 8, lines 1-13).

Applicant's Arguments

13.   Applicant argues the following:

(1) "the original specification contains adequate information to enable a person of ordinary skill in the art to practice the invention pertaining to pore volume calculation and porosity of fracture meshes" (page 5, paper # 10).

(2) Jones et al. do not disclose determining the flows in a pseudosteady state (page 7, paragraph 2, paper # 10).

(3) Jones et al. do not disclose the claimed inventions, for example, the vertex and control

volume are not the node and matrix volume as recited in the claims (page 7, paragraph 4, paper #

10).

(4) for claims 7 and 9, "the combination is based upon impermissive hindsight" (page 9,

paragraph 3, paper # 10).

Response to Arguments

14.   Applicant's arguments filed June 12, 2003 have been fully considered but they are not

persuasive.

14-1.   Response to Applicant's argument (1). In view of Applicant's unpersuasive argument,

claims 7-12 are rejected under 35 U.S.C. 112, first paragraph, as detailed in section **7-1** above.

14-2.   Response to Applicant's argument (2). Cacas et al. have already disclosed determining

the flows in a pseudosteady state, as detailed in sections **11-1** and **12-1** above.

14-3.   Response to Applicant's argument (3). Cacas et al. have disclosed the claimed nodes.

The combined teachings of Cacas et al. and Jones et al. meet the limitation of claimed "matrix

volume", as detailed in sections **11-1** and **12-1** above.

14-4.   In response to Applicant's argument (4) that the Examiner's conclusion of obviousness is

based upon improper hindsight reasoning, it must be recognized that any judgment on

obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so

long as it takes into account only knowledge which was within the level of ordinary skill at the

time the claimed invention was made, and does not include knowledge gleaned only from the

applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392,

170 USPQ 209 (CCPA 1971). Also note, claims 9 and 12 are rejected under 35 U.S.C. 112, first

paragraph, as detailed in section **7-2** above.

Conclusion

15.   Applicant's amendment necessitated the new ground(s) of rejection presented in this

Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing
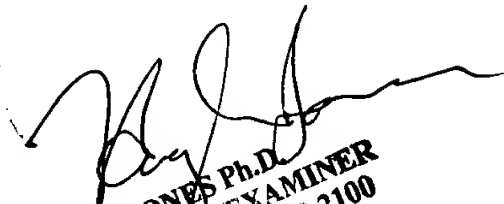
date of this final action.

16.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Herng-der Day whose telephone number is (703) 305-5269. The

examiner can normally be reached on 9:00 - 17:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Kevin J Teska can be reached on (703) 305-9704. The fax phone numbers for the

organization where this application or proceeding is assigned are (703) 746-7239 for regular

communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3900.

Herng-der Day
August 24, 2003

HUGH JONES Ph.D.
PRIMARY PATENT EXAMINER
TECHNOLOGY CENTER 2100